Postprint: An Ethnobotanical Study of Traditional Medicinal Plants for Traumatic Injuries Among the Hakka in Southeastern Guangxi

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Abstract

The Hakka people, through long-term migration and adaptation to new environments, have developed Hakka martial arts culture. The Hakka communities in southeastern Guangxi have summarized rich and unique traditional knowledge of medicinal plants for treating injuries through daily martial arts practice and production/life activities. To systematically investigate and document the species, application methods, and related traditional knowledge of medicinal plants for treating injuries in Hakka areas of southeastern Guangxi, this study, from 2021 to 2024, employed ethnobotanical research methods and investigated the medicinal plants for treating injuries utilized by the Hakka in southeastern Guangxi, using Hakka communities in Luchuan County and Bobai County of Yulin City as case studies. The Fidelity Level (FL) index was used to conduct quantitative assessment of the consistency level of traditional knowledge regarding these medicinal plants. The results showed: (1) A total of 97 species of medicinal plants for treating injuries used by the Hakka in southeastern Guangxi were recorded, belonging to 47 families and 81 genera, with Fabaceae (8 species) and Primulaceae (7 species) having the highest proportions. (2) The local medicinal plants for treating injuries are primarily wild plants, among which branches and leaves (27 species) and whole plant (25 species) are the most common medicinal parts; herbs (36 species, accounting for 37.11%) and shrubs (31 species, accounting for 31.96%) are the main medicinal plant resources for treating injuries used locally in daily life. (3) The processing methods for medicinal plants for treating injuries include boiling for drinking, boiling for washing, boiling for rubbing, soaking in alcohol for rubbing, boiling in soup for drinking, stir-frying with alcohol for hot compress, and pounding for poultice, among which boiling for drinking and boiling for washing are the most widely applied. (4) Six species, including Zanthoxylum nitidum, Calophyllum membranaceum, Ardisia crenata, Ardisia villosa, Justicia ventricosa, and Justicia gendarussa, demonstrated the highest level of knowledge consistency and

are the most commonly used medicines for treating injuries locally. This study proposes recommendations for the inheritance and sustainable development of traditional knowledge of medicinal plants for treating injuries in the local area.

Full Text

Abstract

The Hakka people have developed a distinctive martial arts culture through their long history of migration and adaptation to new environments. In southeastern Guangxi, the Hakka community has accumulated a wealth of unique traditional knowledge on medicinal plants for treating traumatic injuries through daily martial arts practice, agricultural work, and other life activities. To systematically investigate and document the species, application methods, and related traditional knowledge of medicinal plants used for traumatic injuries in the Hakka regions of southeastern Guangxi, this study conducted ethnobotanical research between 2021 and 2024, focusing on Hakka communities in Luchuan and Bobai counties of Yulin City. The Fidelity Level (FL) index was employed to quantitatively assess the consistency of traditional knowledge regarding these medicinal plants. The results revealed: (1) A total of 97 species of medicinal plants for traumatic injuries were documented, belonging to 47 families and 81 genera, with Fabaceae (8 species) and Primulaceae (7 species) being the most represented families. (2) The majority of these plants were wild-harvested (86 species), with branches and leaves (27 species) and whole plants (25 species) being the most commonly used parts. Herbs (36 species, 37.11%) and shrubs (31 species, 31.96%) constituted the primary life forms utilized. (3) Processing methods included boiling for drinking, boiling for washing, rubbing with boiled water, soaking in alcohol for rubbing, boiling as soup, stir-frying with alcohol for hot compresses, and crushing for poultices, with boiling for drinking and washing being the most prevalent. (4) Six species—*Zanthoxylum nitidum*, *Calophyllum membranaceum*, *Ardisia crenata*, *Ardisia villosa*, *Justicia ventricosa*, and *Justicia gendarussa*—demonstrated the highest knowledge consistency levels and represent the most commonly used medicinal plants for treating traumatic injuries in the region. This study provides recommendations for the inheritance and sustainable development of traditional knowledge regarding medicinal plants for traumatic injuries in the area.

Keywords: Hakka, traumatic injuries, medicinal plants, traditional knowledge, ethnobotany

Introduction

Traumatic injuries, also known as acute soft tissue injuries, refer to damage caused by falls, blows, collisions, and other physical impacts, typically manifesting as blood stasis, local swelling, and pain [**?**]. In traditional Chinese medicine, any damage to muscles, bones, and viscera caused by external forces, including

blood stasis, swelling, pain, qi-blood disharmony, meridian obstruction, and organ injury, is collectively termed traumatic injury [**?**]. China has a long history of treating such injuries with traditional Chinese medicine. Notable historical texts such as the Tibetan medical classic *The Four Tantras* and the Chinese medical compendium *Complete Treatise on Traumatic Injuries* document numerous remedies for traumatic injuries [**?**, **?**], many of which involve medicinal plants.

The Hakka constitute an important branch of the Han Chinese. Originally inhabiting the Central Plains region, the Hakka began migrating from northern areas (present-day Henan, Shaanxi, and Anhui) to southern Jiangxi, Fujian, and Guangdong around 300 CE to escape war and natural disasters. Subsequent population pressures led to further migrations to Guangxi, Hunan, Sichuan, Hainan, Taiwan, and other regions [**?**]. After five major migrations, the Hakka now reside in 85 countries and territories worldwide, with major concentrations in China's Jiangxi, Fujian, Guangdong, Guangxi, Hainan, Sichuan, Chongqing, Hong Kong, Macau, and Taiwan [**?**]. During their migrations, to adapt to new environments and protect against wild animals, bandits, and external threats, most Hakka communities developed sophisticated martial arts skills to better protect their families, giving rise to Hakka martial arts culture [**?**, **?**]. Hakka martial arts practitioners are numerous, and distinct boxing styles have emerged in different regions [**?**, **?**].

Southeastern Guangxi represents one of the primary Hakka settlement areas, with Bobai and Luchuan counties hosting the largest populations. Luchuan County is home to over 700,000 Hakka people, approximately two-thirds of the local population [**?**]. Bobai County has more than 1.4 million Hakka residents, comprising over 75% of the total population and earning recognition as the county with the largest Hakka population worldwide [**?**]. The Hakka communities in southeastern Guangxi have long maintained martial traditions, renowned for long weapons, primary long boxing, and iron bar throat-locking techniques [**?**]. Historically, martial arts were practiced in virtually every village in Luchuan, Bobai, and other Yulin Hakka areas, with numerous martial arts schools established in towns and county seats. During our ethnobotanical investigations of medicinal plants in southeastern Guangxi Hakka regions, we discovered a rich repository of traditional knowledge regarding medicinal plants for traumatic injuries. This knowledge system developed not only in connection with local martial arts culture but also in relation to the Hakka living environment. The topography of southeastern Guangxi Hakka areas consists primarily of hills and mountains, with residents sustaining their livelihoods through traditional agriculture. Daily activities involving heavy physical labor, particularly in mountainous areas, increase the likelihood of falls and injuries [**?**]. Consequently, the Hakka have accumulated extensive traditional knowledge of medicinal plants for traumatic injuries through long-term martial arts practice and agricultural work.

Although traumatic injuries are common in daily life, reports on plant-based

treatments for such conditions remain relatively scarce in China. Zhou et al. [?] documented 18 medicinal plants used by the Miao people in Guizhou for traumatic injuries and snakebites, while Chen et al. [?] and He et al. [?] reported 18 and 43 species, respectively, used by the Shui people in Guizhou and in the Xiangxi region. Southeastern Guangxi possesses a strong traditional Chinese medicine culture, with traumatic injury remedies such as "Zhenggu Shui" and "Yunxiang Jing" renowned both domestically and internationally. Over time, Hakka medicine has continuously interacted with local traditional Chinese medicine culture, forming a distinctive Hakka traditional medicine culture that includes herbal tea and medicinal cuisine traditions. Traditional knowledge of medicinal plants for traumatic injuries constitutes an essential component of Hakka medical culture and holds significant importance for Hakka production and daily life. However, research on medicinal plant resources and related traditional knowledge for traumatic injuries in this region remains inadequate. With socioeconomic development and diversified healthcare options, younger generations increasingly prefer simple proprietary Chinese medicines or Western pharmaceuticals. Additionally, most local healers maintain cautious attitudes toward knowledge transmission, putting this traditional medical knowledge at risk of being lost due to reduced utilization [?, ?]. To investigate and document traditional knowledge of medicinal plants for traumatic injuries in southeastern Guangxi Hakka regions, this study employed ethnobotanical methods to conduct surveys in Luchuan and Bobai counties of Yulin City. Through quantitative evaluation methods, we examined local characteristics of medicinal plant use, current status of resource management and utilization, and strategies for traditional knowledge inheritance and protection. This research provides foundational materials for the inheritance and development of local traditional Chinese medicine culture and offers case references for new drug development and sustainable utilization of medicinal plant resources.

1. Study Area

Yulin City is located in southeastern Guangxi Zhuang Autonomous Region, between 109°39 –110°18 E and 22°19 –23°01 N. The region enjoys a mild, humid subtropical monsoon climate year-round, with an average temperature of 22.5–23.2 °C and annual precipitation of 1,070.6–1,434.6 mm. The terrain features a complex mosaic of mountains, hills, valleys, terraces, and plains, with hilly terraces being the most extensive. Plains and basins account for 17.4% of the city's area, hilly terraces for 49.4%, and mountainous areas for 33%. This favorable geographical environment and suitable climate have nurtured rich plant resources. According to statistics, Yulin hosts 4,343 species of vascular plants across 229 families, including 2 nationally first-class protected species, 11 second-class protected species, and 11 key protected species in Guangxi [?]. The city's total population exceeds 7.2 million, predominantly Han Chinese. Among Han dialects, Cantonese, Min, and Hakka are spoken, with over 3 million Hakka dialect speakers, primarily distributed in Bobai and Luchuan counties [?].

2. Methods

2.1 Literature Research

We compiled information on Hakka medicinal plants in southeastern Guangxi and gained an understanding of local Hakka culture, history, geography, and climate through sources including *Annals of Yulin City*, *Yulin Hakka*, *Flora of Guangxi*, *List of Medicinal Plants in Guangxi*, *Selected Guangxi Herbal Medicine*, and *Luchuan Herbal Medicine*.

2.2 Ethnobotanical Survey

Based on literature review, preliminary survey results, and recommendations from local administrators, we selected Hakka settlements in southeastern Guangxi that have relatively well-preserved traditional culture as study sites. These included villages and communities in Luchuan County's Wenquan Town (Fengchun Village, Baini Village, Dongshan Village), Wushi Town, Liangtian Town (Longkou Village, Wenguan Village, Changtang Village), Gucheng Town (Qinger Village), Qinghu Town (Yongping Village), and Bobai County's Bobai Town (Lang Village, Dongxu Street), Ningtan Town (Li Village), Yingqiao Town (Chunjia Village), Napu Town, Huangling Town, Dadong Town (Yuzhu Village), Shahe Town, Shuiming Town, Dungu Town (Jiumen Village), and Lingjiao Town (Jiaolintang Village) [Figure 1: see original paper].

From January 2021 to April 2024, we conducted surveys in these locations using ethnobotanical research methods including snowball sampling, key informant interviews, and semi-structured interviews [**?**]. We collected traditional knowledge and specimens of medicinal plants for traumatic injuries used by local Hakka people. During the surveys, we documented detailed informant information (name, gender, age, education level, occupation, etc.) and recorded local names, usage methods, indications, plant parts used, collection sites, habitats, and resource status for each medicinal plant, compiling an inventory of medicinal plants and related traditional knowledge for traumatic injuries in southeastern Guangxi Hakka regions.

2.3 Plant Identification Methods

Medicinal plant specimens collected in the field or purchased in markets were identified by comparing morphological characteristics and geographical origins with *Flora of Guangxi*, *Flora of China*, and online databases including https://www.cvh.ac.cn, http://www.iplant.cn, and http://www.worldfloraonline.org. All specimens related to traumatic injuries are deposited in the herbarium of the Natural History Museum of Guangxi (NHMG).

2.4 Quantitative Evaluation Method

We employed the Fidelity Level (FL) index to verify the consistency of traditional knowledge regarding medicinal plants for traumatic injuries, calculated using the following formula:

$$FL = \frac{Ip}{Iu} \times 100\%$$

where Ip represents the total number of informants who mentioned a particular plant for traumatic injuries, and Iu represents the total number of informants who mentioned that plant for any use. Higher FL values indicate greater similarity in plant use among local people. In this study, high FL values for a medicinal plant suggest local preference for that species, potentially reflecting better therapeutic efficacy for traumatic injuries [**?**].

3. Results

3.1 Composition of Medicinal Plants for Traumatic Injuries in Southeastern Guangxi

Our investigation documented 97 species of medicinal plants used for traumatic injuries in southeastern Guangxi Hakka regions, belonging to 47 families and 81 genera, demonstrating rich diversity in plant-based treatments for traumatic injuries. In terms of family distribution, Fabaceae, Primulaceae, Zingiberaceae, and Rubiaceae were most common, with Fabaceae comprising the largest number of species (8), followed by Primulaceae (7). At the genus level, multiple species within *Ardisia*, *Melastoma*, *Spatholobus*, *Cissus*, and *Curcuma* were mentioned, highlighting the importance of these genera in treating traumatic injuries in southeastern Guangxi Hakka communities. This taxonomic distribution not only reflects current utilization of folk medicinal plants in the region but also demonstrates the diversity of plant resources and the richness of ethnobotanical knowledge.

3.2 Traditional Knowledge of Medicinal Plants for Traumatic Injuries

In terms of resource types, the majority of plants used for traumatic injuries were wild-harvested (86 species), reflecting both deep reliance on natural resources and the irreplaceable role of wild plants in folk medical practice. Wild plants, due to their specific growing environments, often contain richer medicinal compounds and constitute an essential component of traditional disease treatment. Among cultivated species (23 species), 16 have additional medicinal functions, while 11 possess ornamental, economic, or edible value. Although these 23 cultivated species do not dominate numerically, their presence reflects the inheritance of traditional knowledge and sustainable plant resource utilization in Hakka communities, further illustrating the important cultural role these plants play.

Analysis of life forms reveals the types of plants relied upon for traumatic injury treatment in southeastern Guangxi Hakka regions. Herbs (36 species, 37.11%) and shrubs (31 species, 31.96%) represent the predominant life forms, their ubiquity and accessibility making them the primary resources for daily use. These plants are not only easy to identify and collect but also contain diverse medicinal compounds that meet various therapeutic needs. Additionally, the presence of lianas (17 species) and trees (13 species) reflects the region's diverse ecosystems and rich biodiversity. These life forms often possess special medicinal values particularly important for treating specific types of traumatic injuries. This comprehensive utilization of biodiversity, closely related to Guangxi's geography and climate, demonstrates the Hakka people's profound understanding and utilization of local plant resources.

Statistics on medicinal parts reveal extensive use of multiple plant components for traumatic injury treatment [Figure 2: see original paper]. Branches and leaves (27 species) and whole plants (25 species) were most commonly used, reflecting the practical advantages of easily collecting and processing shrubs (for branches/leaves) and herbs (for whole plants). Roots and stems were each used from 16 species, demonstrating significant therapeutic efficacy for these parts in folk medical practice. Utilization of aerial parts, rhizomes, fruits, and bark further confirms the Hakka people's deep understanding and flexible application of unique medicinal values from different plant components.

Regarding usage methods, boiling for washing (49 mentions) and boiling for drinking (48 mentions) were most prevalent, highlighting the central role of water decoction in folk treatment of traumatic injuries in the region. This traditional application method is not only simple and practical but also effectively utilizes plant medicinal properties. Additional methods such as alcohol-soaking for rubbing, stir-frying with alcohol for hot compresses, and crushing for poultices demonstrate the innovative and diverse nature of ethnomedicinal practices in Hakka communities. Special preparations, such as sun-drying and powdering to make pills, showcase the Hakka people's profound knowledge and rich experience with medicinal plants, reflecting their unique insights into healthcare and treatment.

3.3 Hakka Classification and Treatment of Traumatic Injuries

Generally, Hakka folk medicine in southeastern Guangxi classifies traumatic injuries into two categories: internal injuries and external injuries. Internal injuries involve damage to internal organs and muscle tissue with blood stasis and obstruction, while external injuries include fractures, dislocations, tendon ruptures, ligament damage, as well as closed wounds such as abrasions, contusions, and sprains characterized by skin redness, swelling, and pain, and open wounds from falls, cuts, and bites. This classification aligns essentially with modern traditional Chinese medicine traumatology theory [**?**] but differs from folk classifications in Xiangxi (which categorize injuries as sprains, contusions, strains, and bone injuries) [**?**].

The Hakka employ different medicinal plants and treatment methods according to injury severity. For mild abrasions and contusions causing redness, swelling, and bruising, they use anti-inflammatory and analgesic plants such as *Zanthoxylum nitidum* and *Glechoma longituba* for medicinal baths, or apply medicinal wines prepared from *Cyclea barbata* and *Wikstroemia indica*. For fractures, they first use plants like *Zanthoxylum nitidum*, *Justicia ventricosa*, *Justicia gandarussa*, *Sambucus javanica*, and *Piper hongkongense* for bone setting, then supplement with dietary therapy using soups made from *Cissus hexangularis*, *Cissus pteroclada*, and *Tinospora sinensis* cooked with meat and bones. For dislocations and post-injury meridian obstruction, they use meridian-opening herbs such as *Tinospora sinensis* and *Entada phaseoloides* combined with pig intestines or meat for dietary therapy. For open wounds, hemostatic and analgesic plants like *Uraria crinita*, *Melastoma malabathricum*, and *Rhodomyrtus tomentosa* are employed. For severe internal injuries, both external treatment with blood-activating and stasis-resolving herbs and internal administration of blood-tonifying, meridian-opening medicines are used, such as *Zanthoxylum nitidum*, *Biancaea sappan*, and *Piper hongkongense*, based on the belief that combined internal and external treatment promotes faster recovery from internal injuries.

3.4 Quantitative Evaluation of Medicinal Plants for Traumatic Injuries

In southeastern Guangxi Hakka regions, 27 medicinal plants for traumatic injuries had FL values exceeding 80%, representing commonly used medicinal materials. Among these, six species—*Zanthoxylum nitidum*, *Calophyllum membranaceum*, *Ardisia crenata*, *Ardisia villosa*, *Justicia ventricosa*, and *Justicia gendarussa*—achieved FL values of 100%, indicating they are the most frequently used medicinal plants for traumatic injuries locally. Additionally, 21 other species, including *Entada phaseoloides*, *Kadsura coccinea*, and *Kaempferia rotunda*, had FL values above 80%, representing commonly utilized medicinal plants. In ethnomedicinal plant research, high FL values serve as important references for biological, phytochemical, and pharmacological evaluation to prove efficacy and screen for new drugs [**?**]. For example, *Calophyllum membranaceum* is a relatively valuable and commonly used medicinal plant for traumatic injuries in the region. Research has shown that its roots contain xanthones with significant anti-inflammatory effects [**?**] and have been utilized in developing commercial traumatic injury medicines such as Yulin Zhenggu Shui.

Statistical analysis of the nature and flavor of 27 medicinal plants with FL values above 80% [Figure 3: see original paper] revealed that neutral-natured medicines predominated (48.15%), while acrid and bitter flavors were most common (46.81%). Informants explained that for internal injuries from trauma, using warming and tonifying medicines is not conducive to recovery and may even transform internal injuries into abscesses, worsening the condition. Therefore, they prefer neutral medicines or add cooling medicines to balance the properties

when using warming tonics. In traditional Chinese medicine theory, medicinal effects are closely related to flavor. According to traditional Chinese medicine differentiation theory, acrid medicines typically have dispersing, qi-moving, and blood-activating functions, while bitter medicines have dampness-drying and fire-draining effects [**?**]. Overall, through in-depth analysis of life forms and resource types of plants used for traumatic injuries in southeastern Guangxi Hakka regions, we can understand not only the actual situation of plant resource utilization but also gain insights into the wisdom and strategies of Hakka people in traditional therapeutic practices. These analyses provide valuable perspectives and foundations for further exploration of regional ethnobotanical knowledge, promotion of biodiversity conservation, and inheritance and innovation of traditional knowledge.

4. Discussion

4.1 Characteristics of Hakka Medicinal Plant Use for Traumatic Injuries

Processing methods for traumatic injury medicinal plants in southeastern Guangxi Hakka regions include raw preparation (crushing, powdering), water processing, fire processing (stir-frying), and alcohol processing. Notably, nearly one-third of the medicinal plants (31 species) can be processed using two or more methods, demonstrating rich practical experience among local Hakka people. Alcohol serves as the most common processing medium, with 25 medicinal plants used in conjunction with alcohol. Local people believe alcohol not only disinfects but also opens meridians and promotes blood circulation. Therefore, medicinal plants are prepared as alcohol tinctures for internal consumption, external rubbing, or stir-fried with alcohol for hot compresses. Research indicates that alcohol can increase the solubility of certain chemical compounds and serves as an excellent solvent for extracting medicinal active ingredients, having been widely used in tincture preparation since ancient times [**?**, **?**, **?**]. The Hakka prepare medicinal tinctures for convenient preservation and mobile medical practice, believing that stir-frying fresh herbs with alcohol for hot compresses is particularly effective for treating bruises. Phytochemical studies have shown that different processing methods significantly affect the active components of medicines [**?**]. Therefore, to verify the efficacy of different processing methods for the same medicinal plant used by southeastern Guangxi Hakka people, future experimental research should investigate the active component content and pharmacological effects of these various processing methods.

Dietary therapy using medicinal food homology represents a common treatment approach in southeastern Guangxi Hakka communities. Numerous medicinal plants, including *Calophyllum membranaceum*, *Kadsura coccinea*, *Cissus hexangularis*, *Cissus pteroclada*, *Tinospora sinensis*, *Phanera championii*, *Muehlenbeckia platyclada*, and *Carica papaya*, are used in soups cooked with pig feet or meat. This dietary approach using medicinal food homology can improve

patient nutrition, enhance immunity, and increase absorption and utilization of medicinal active ingredients. Research in eastern Guangdong Hakka regions has also reported some medicinal food homology plants for traumatic injuries [**?**], but only *Tinospora sinensis* is shared with southeastern Guangxi Hakka regions. In eastern Guangdong, additional plants such as *Uraria crinita*, *Glechoma longituba*, *Berchemia lineata*, *Ixora chinensis*, and *Hypericum japonicum* are used as medicinal foods for traumatic injuries [**?**]. While these plants are also used for traumatic injuries in southeastern Guangxi Hakka regions, the applications differ. For example, *Uraria crinita* is primarily used as a tea for traumatic injuries, while *Glechoma longituba*, *Berchemia lineata*, *Ixora chinensis*, and *Hypericum japonicum* are applied externally through washing with boiled water or hot compresses.

Differences in plant usage exist between Hakka and other ethnic groups. For instance, *Hypericum japonicum* is used by Zhuang, Yao, and Maonan communities primarily for clearing heat and detoxifying, treating hepatitis, cirrhosis, nephritis, snakebites, acute conjunctivitis, and tonsillitis [**?**, **?**, **?**]. In contrast, Hakka communities in eastern Guangdong and southeastern Guangxi use *Hypericum japonicum* not only for clearing heat, detoxifying, dispelling dampness, and treating jaundice [**?**], hepatitis, and snakebites, but also commonly for traumatic injuries.

4.2 Additional Efficacies of Hakka Traumatic Injury Medicines

Over 80% of medicinal plants for traumatic injuries in southeastern Guangxi Hakka regions are also used to treat other ailments including sore throat, rheumatism, gastrointestinal discomfort, snakebites, hepatitis, gynecological diseases, skin conditions, hypertension, and diabetes. For example, *Ardisia villosa* treats throat diseases, joint pain, and bone hyperplasia. *Entada phaseoloides* is used for throat swelling, laryngitis, and rheumatism. *Kadsura coccinea*, a relatively valuable medicinal plant, treats not only traumatic injuries but also skin diseases, stomach ailments, rheumatism, kidney deficiency, and diabetes. These additional uses fully demonstrate the rich traditional knowledge of medicinal plants among southeastern Guangxi Hakka people and underscore the importance of these plants for maintaining local health, warranting further multidisciplinary investigation and promotion of their scientific basis.

4.3 Current Status of Resource Management and Traditional Knowledge Inheritance

During our interviews, we found that most herbalists and elderly individuals with traditional Chinese medicine knowledge cultivate some rare, valuable, or frequently used herbs in their home gardens or woodlots according to their needs. Experienced herbalists possess clear knowledge of local wild medicinal plant resource distribution and harvest herbs based on local abundance. For example, for valuable species previously harvested for roots or whole plants, such as *Zanthoxylum nitidum*, they now harvest only stems or branches and leaves

as substitutes. Due to the warm, humid climate year-round, which makes herb preservation difficult, local Hakka people primarily use fresh medicinal plants for traumatic injuries, harvesting small quantities as needed. These practices protect local medicinal plant diversity and promote sustainable utilization, meriting advocacy and further promotion. However, since 2001, extensive eucalyptus plantations have replaced native vegetation around Hakka settlements in southeastern Guangxi. According to informants, many previously common medicinal plants, such as *Kadsura coccinea*, *Spatholobus suberectus*, *Stephania cephalantha*, *Aristolochia fordiana*, *Aristolochia fordiana*, and *Micromelum falcatum*, have become very rare. As medicinal plant resources decline sharply, related traditional knowledge is also disappearing from public consciousness.

Currently, traditional knowledge of traumatic injuries in southeastern Guangxi Hakka regions faces severe inheritance challenges. First, accelerated urbanization and lifestyle changes have reduced the number of martial arts practitioners, consequently decreasing the consumer base for traditional traumatic injury herbs. Additionally, with improved medical standards and the influence of Western medicine, many people prefer proprietary medicines such as "Honghua Oil," "Huoluo Oil," and "Yunnan Baiyao," or fast-acting Western analgesics and anti-inflammatories, rather than traditional herbal remedies. Furthermore, traditional traumatic injury medical knowledge is primarily held by individuals over 60 years old and transmitted mainly through oral instruction. Under the influence of Hakka clan concepts of "transmitting within but not outside the family," the inheritance of local traditional Chinese medicine knowledge is restricted.

Therefore, to protect traditional Chinese medicine culture and biodiversity in southeastern Guangxi Hakka regions, comprehensive surveys and documentation of local medicinal plant resources and related traditional knowledge using multidisciplinary approaches are urgently needed. Priority should be given to chemical composition analysis and pharmacological mechanism studies of highly valuable medicinal plants to provide scientific validation for Hakka medicinal plant knowledge. Additionally, local authorities should strengthen conservation of medicinal plant resources through "farmer + enterprise" cooperative cultivation of wild medicinal plants with high demand, limited resources, and proven efficacy to ensure sustainable utilization. Simultaneously, efforts should combine local Hakka culture and customs, such as martial arts and lion dance traditions, to increase promotion of traditional Chinese medicine knowledge for traumatic injuries, advancing the inheritance, protection, and innovative development of distinctive local traditional Chinese medicine culture.

Conclusion

This study systematically investigated Hakka communities in Luchuan and Bobai counties, Yulin City, Guangxi Zhuang Autonomous Region, documenting 97 species of medicinal plants used for traumatic injuries across 47 families and 81 genera. Fabaceae and Primulaceae were the most represented families,

reflecting their local importance. The majority of medicinal plants for traumatic injuries were wild-harvested, with branches/leaves and whole plants being the most common medicinal parts, and herbs and shrubs representing the most abundant resources. Common application methods included boiling for drinking and washing. Six species—*Zanthoxylum nitidum*, *Calophyllum membranaceum*, *Ardisia crenata*, *Ardisia villosa*, *Justicia ventricosa*, and *Justicia gendarussa*—showed the highest consistency levels and constitute core medicines for traumatic injuries locally. These medicinal plants hold significant application value and warrant further research and development. Currently, traditional knowledge regarding the management and utilization of traumatic injury medicinal plants is at risk of disappearance. Urgent action is needed to conduct comprehensive resource surveys in southeastern Guangxi Hakka regions, strengthen artificial propagation and cultivation of commonly used but rare medicinal plants, and ensure sustainable utilization of local medicinal plant resources. Concurrently, promotion of traditional knowledge related to traumatic injury medicinal plants should be enhanced through integration with Hakka traditional culture and customs to facilitate inheritance and development of distinctive local traditional Chinese medicine culture.

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Note: Figure translations are in progress. See original paper for figures.